perspective of the plant kingdom enormously. It is high time to present this new field of knowledge to a much larger group than paleobotanists and morphologists, and Miss STOPES has undertaken to do this in her little book entitled "Ancient plants."[2]

To write such a book is more difficult than to prepare one for special students, for it involves careful selection of material and a simple style. The former always invites the hypercriticism of specialists; and the latter is in danger of sacrificing accuracy to picturesqueness. However, the book is not written for specialists; and extreme accuracy is not so important as vivid impressions. Miss STOPES has certainly succeeded in accomplishing well the task she set for herself. Judgment may vary as to the selections, but this is inevitable; the brevity of treatment has been criticized, but that was a part of the purpose; the attractive and often very picturesque style, even though it might be accused of misleading now and then, is far better for the purpose in mind than a style that flavors of mathematical precision. Such books are intended to arouse interest, and if they stimulate any one to further study, all possible misconceptions will be corrected.

The chapter headings suggest the general treatment: ii, "Various kinds of fossil plants"; iii, "Coal, the most important of plant remains"; iv, "The seven ages of plant life"; v, "Stages in plant evolution"; vi, "Minute structure of fossil plants—likenesses to living ones"; vii, the same—"differences from living ones"; vii–xvii, "Past histories of plant families"; xviii, "Fossil plants as records of ancient countries."

The book can be recommended to all students of botany who should supplement their knowledge of living plants with some information concerning ancient plants. Certainly no student of morphology can afford to neglect the history of his groups, and this little book will serve him well as an introduction.—J. M. C.

NOTES FOR STUDENTS

Mutations in nature.—Mutations probably occur in nature as frequently, in proportion to the percentage of the seeds which succeed in germinating and developing, as in experimental cultures, but actual proof of such mutation must be always wanting. When a single individual of a hitherto unknown type is seen to differ by some marked characteristic from the associated typical individuals of the most closely related species, the natural inference is that the atypic plant is a mutant. If such a plant is found to reproduce its characters in its offspring, such inference is strengthened, but there still remains the question of possible hybridization, and if that can be satisfac-

[2] STOPES, MARIE C., Ancient plants; being a simple account of the past vegetation of the earth and of the recent important discoveries made in this realm of nature study. 8vo. pp. viii+198. *figs. 122.* London: Blackie & Son; and New York: D. Van Nostrand Company. 1910. $2.00.

torily ruled out, there is the possibility that the form in question is not itself a mutant, but the offspring of a mutant which appeared in some preceding generation. This last question, of course, can never be cleared up in any instance, but is a consideration of no essential consequence. TRABUT[3] reports finding near the city of Constantine in Algeria a spineless individual of the wild artichoke (*Cynara Cardunculus*) in an extensive population of the ordinary spiny plants. While considerable variation is found in the vegetative characters of *C. Cardunculus*, no similar individual has ever been reported before. This plant being wholly unarmed would undoubtedly have disappeared undiscovered had it not chanced to grow within the inclosure about the waterworks reservoir of Constantine. The seedlings of this spineless individual have not yet been grown, but it seems probable that it will breed true. There are spineless varieties of cultivated artichokes (*C. Scolymus*), and the possibility of hybridization is not positively precluded, but is rendered less probable by the facts that none of the latter are grown in the vicinity of Constantine and that the new form seems to be typical *C. Cardunculus* in everything but the spines.

Much more important than this supposed mutant of *Cynara* is the discovery of a new form of *Capsella*,[4] of which a single specimen was found growing among an abundance of *C. bursa-pastoris* at Izeste, Basses-Pyrénées, France. The history of this new species, which is to be known as *C. Viguieri* Blaringhem, parallels that of the celebrated *Capsella Heegeri*, but *C. Viguieri* shows a variation of the capsules in the opposite direction from that presented by *C. Heegeri*. A very large majority of the capsules have four valves of the same general form as those of *bursa-pastoris*, placed at right angles to each other, but the number of valves varies from 2 to 8. Counts of nearly 10,000 fruits, taken at random from plants grown from the seeds of the original specimen, showed the following frequencies: 2-valved, 2; 3-valved, 81; 4-valved, 8450; 5-valved, 301; 6-valved, 288; 7-valved, 24; 8-valved, 16. The new species is normally fasciated, and breeds true to this character as well as to the high number of valves, except when subjected to unfavorable conditions. As grown at Bellevue, France, the leaves of *C. Viguieri* are almost entirely unlobed, while the leaves from a number of pedigrees of *C. bursa-pastoris*, also secured from Izeste and grown under the same conditions, had always the complex lobing characteristic of the reviewer's type *C. bp. heteris*. The author lays particular stress upon the fact that several other species of Cruciferae possess 4-winged capsules. He names several species of *Tetrapoma* which if 2-valved would be classified as *Nasturtium; Holar-*

[3] TRABUT, L., Sur une mutation inerme du *Cynara Cardunculus*. Bull. Soc. Bot. France **57**:350–354. *pls. 15, 16.* 1910.

[4] BLARINGHEM, L., Les mutations de la bourse à pasteur (*Capsella Heegeri* Solms, *C. Viguieri*, n. sp.). Bull. Sci. France et Belg. VII. **44**:275–307. *pl. 6. figs. 10.* 1911.

gidium if 2-valved would be a *Draba;* while the Californian genus *Tropidocarpon* has one species with 2-valves and one (*T. capparideum* Green) with 4. Tetracarpellary cultivated varieties of *Brassica* and *Isatis* are also known. Such instances as these, of the recurrence of similar characteristics in more or less closely related species or genera, support the view that variation is definite or "orthogenetic" rather than entirely fortuitous. The author believes that such facts are directly opposed to the older conception that species, genera, and families have a monophyletic origin. On p. 280 the gametic formulae of the reviewer's forms, *Capsella bursa-pastoris tenuis* and *C. bp. rhomboidea*, are transposed; and on p. 304 the date of the discovery of *C. Heegeri* is stated erroneously as 1907 and 1908, the correct dates being 1897 and 1898.—GEO. H. SHULL.

Geotropism and epinasty.—KNIEP[5] has studied in detail the part played by geotropism and epinasty in the orientation of certain foliage leaves. He makes much use of modified forms of the oblique and intermittent clinostats of FITTING. With these instruments FITTING[6] answered conclusively many questions on the geotropism of orthotropic organs that two or three decades of work with other instruments had left unanswered. Now, KNIEP proceeds to clear up a number of questions in a plagiotropic organ, the leaf.

In the main *Lophospermum scandens* was used, for the medium-aged leaves of this plant show no sleep movement and little tendency to dark rigor; therefore, they are well adapted to experimentation in darkness. When leaf blades of this plant are placed out of their normal rest position, they recover it by growth-bending of the petiole. During the bending the rate of growth of the middle line is greatly increased. KNIEP designates the usual position of the leaf as the *normal horizontal* position. If the plane of the blade is so changed that the petiole end remains in the original plane but the apical end falls below it, the angle it forms with the normal horizontal position is said to be negative. If this displacement continues $-180°$, the leaf is then in the *inverse horizontal position.* By a reverse movement from the normal horizontal rest position a positive displacement is brought about. If this displacement continues $+180°$, the *inverse horizontal position* is reached. If in darkness a plant is so tilted that a leaf blade takes a position of $-1°-114°$, a rapid growth sets up on the morphologically lower side of the petiole (concave bending) and the blade finally acquires its normal horizontal position. If the plant is so tilted that the blade holds any position from $-116°$ to $\pm180°$, or from $+1°$ to $\pm180°$, rapid growth begins on the upper side of the petiole (convex bending) and the leaf finally acquires its normal horizontal position. The labile rest position, then, is at approximately $-115°$.

[5] KNIEP, HANS, Ueber den Einfluss der Schwerkraft auf die Bewegungen der Laubblätter und der Frage der Epinastie. Jahrb. Wiss. Bot. **48**:1–72. 1910.

[6] Jahrb. Wiss. Bot. **45**:675–700. 1905.